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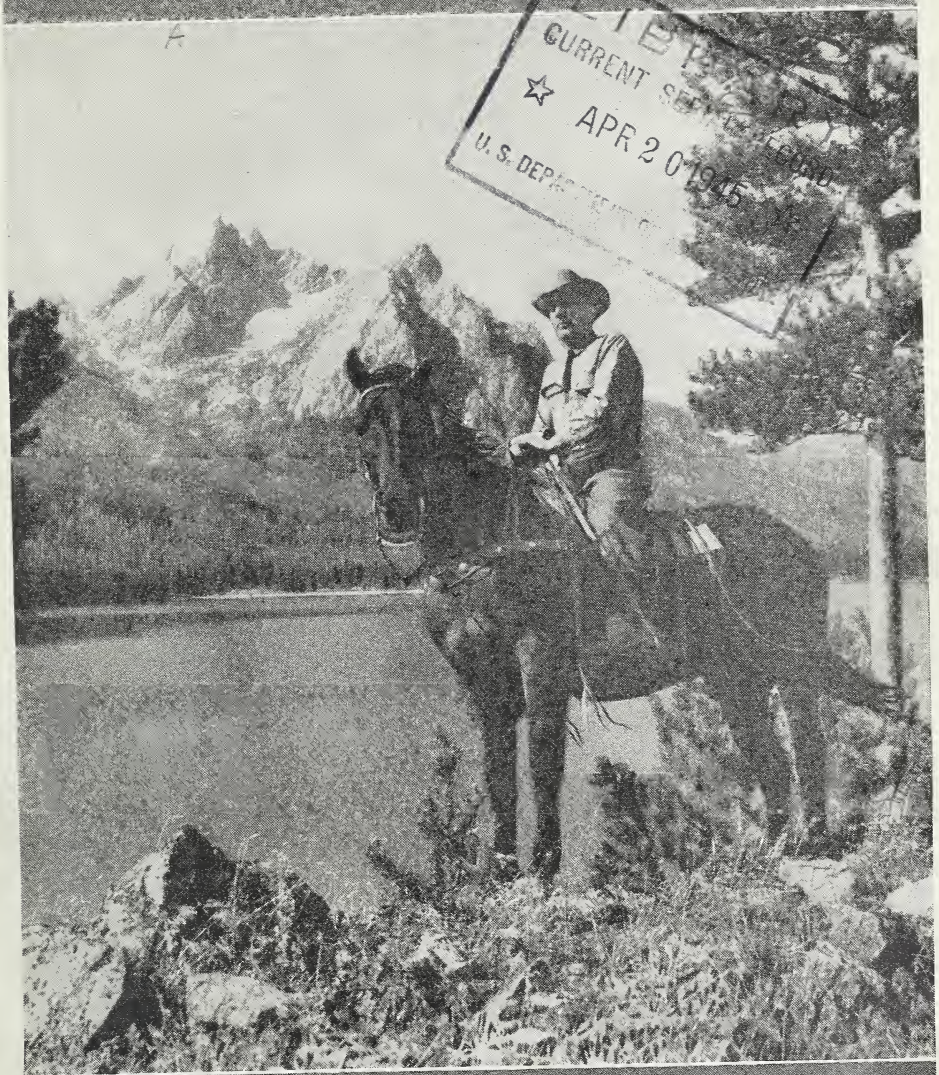
THE WORK OF THE U. S. FOREST SERVICE



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THE WORK OF THE U. S. FOREST SERVICE

Prepared by the Forest Service

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Introduction

The problem of forest depletion, which went on in the United States practically unchecked for more than 100 years, was first seriously attacked at the turn of the twentieth century.

The need for conservation had been felt for a long time, but it was not until increasing demands of a rapidly expanding civilization sharply accelerated the rate of forest use—and misuse—that public opinion called for Federal action to halt the destruction of our forest resources.

Forests were being logged without thought of future timber requirements. Uncontrolled fires and excessive cutting were destroying enormous areas in forest, preventing natural reproduction of trees, and stripping important watersheds of their protective covering. Overgrazing had seriously depleted a large part of the western range. In short, it was clear that the public, through the Federal Government, must take steps toward the proper management of lands that bear great influence upon the public welfare and exert every effort toward extending the application of sound principles of forest and range management and use.

At this time, also, the need for scientific forestry became evident. Public-spirited citizens wished to apply this new knowledge in order to restore and maintain the usefulness of the country's forest lands.

Under scientific methods, timber instead of being "mined" becomes a crop. The mature trees are used as "earned interest," while younger, growing trees are left intact as the "capital stock." The economic and

soil-protective values represented by a forest in a healthy growing condition are thus permanently maintained.

Forestry, as applied on the national forests managed by the Forest Service, is concerned with the perpetuation and development of forest crops in order that they may continue to yield their many benefits to mankind. Timber, water, forage, wildlife, recreational features, and other resources of the national forests are for the use of the people. The timber contributes to our industrial enterprises and furnishes steady employment in the woods and in wood-using plants. The vegetative cover protects against erosion watersheds that are the source of much of our water for irrigation and hydroelectric power and helps to minimize floods and insure pure and abundant water supplies for many hundreds of towns and cities. The forage furnishes seasonal grazing for about 10 million head of livestock of all ages. Fish in thousands of miles of mountain streams, and big-game animals, along with numerous small fur bearers and game birds, provide sport and enjoyment to the angler and hunter. Roads, trails, and other improvements have made superb vacation places accessible and have created in the forests a vast playground for millions of recreation seekers.

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FIGURE 1.—Forested mountain slopes conserve water and help to prevent floods and soil erosion.

There is a vast amount of forestry work to be done. Timber growth is still far less than the drain on our forests. Thus, in 1943 it was estimated that total drain on the forests of the United States, including timber cut or destroyed by fire, insects, disease, etc., was nearly 17 billion cubic feet, while total annual growth probably amounted to only 11.2 billion feet. In stands of saw-timber size, the drain was nearly twice the annual growth.

Recent studies indicate that in addition to the present public forests about 150 million acres of privately owned timberland are so depleted, poorly located, of such low value, or watershed or other public values are so high that private management cannot reasonably be expected to meet the requirements of public interest, at least not without undue subsidy. Acquisition of these lands by the public, and their management as Federal, State, or local forests, appears to be the most feasible course.

Moreover, it becomes increasingly clear that orderly control of timber

cutting and encouragement of better forest management are needed in order to meet, adequately, the interests of the people as a whole in the forest lands of the United States.

Throughout the Nation there is the large task of coupling forest and range conservation with the social and economic welfare of communities dependent upon forest and range industries. Use of forest and range lands must provide steady, gainful employment for a sizeable portion of the country's population, maintain pay rolls, and sustain the tax base to support the functions of local government.

In summary, the work of the Forest Service is directed toward determining and applying measures for making our forested lands, grazing lands, watersheds, and related wild lands contribute in the fullest degree to the lives of our people and the solution of some of our pressing economic and social problems.

The National Forests

THE FOREST-CONSERVATION MOVEMENT

Forestry in the Federal Government had its real beginning in 1876 with the appointment by the Department of Agriculture of a special agent to study general forest conditions in the United States. In 1877 Congress granted its first appropriation of $6,000 for the purpose of obtaining information preparatory to establishing a Division of Forestry, which was created in 1881. For a long time, however, the division received only a meager annual appropriation and was little more than a bureau of information and advice.

It was not till 1891 that effective steps were taken to protect the forests on the public domain from destruction by fire and reckless cutting and insure a more regular flow of water in the streams. In that year Congress authorized the President to set aside forest reserves, as the national forests were then called. The first reserve—the Yellowstone Park Timberland Reserve—was created by President Harrison. The movement soon gained great momentum and before his term expired, Harrison had set aside reserves totaling 13 million acres. President Cleveland added more than 20 million acres.

The original act of 1891 made no provision for administering the forests, and withdrawal of the land from all forms of settlement met with vigorous disapproval, especially in the West, where the reserves were situated. These defects, however, were met in some degree by Congress in a law of June 4, 1897, outlining a system of organization and management of the forest reserves and placing their administration under the Secretary of the Interior.

Government administration required the application of scientific forestry. Timber cutting had to provide for the growing of a new timber crop. On the ranges, which had been seriously injured by decades of unrestricted grazing, it was necessary to devise methods for increasing the forage crop. Both timber use and grazing use had to be so managed that watersheds would be adequately protected. Indeed, all the resources of the forests needed careful consideration and plans had to be designed for their best development.

The technical problems involved were felt by the Department of the Interior to be outside its province. Consequently aid was requested from experts in the Department of Agriculture—whose Division of Forestry had by 1901 developed into the Bureau of Forestry—but soon transfer of the administration of the reserves to the latter Department was recommended by the Secretary of the Interior.

The transfer, made by act of Congress, took place in 1905, when the old Bureau of Forestry became the Forest Service, with the ardent conservationist, Gifford Pinchot, as Chief Forester. The Secretary of Agriculture commissioned the Forest Service to manage the forest reserves, which then comprised 56 million acres, so that they would provide the greatest good to the greatest number of people in the long run. This cardinal principle has been steadfastly adhered to through the years.

FORESTS CREATED FROM THE PUBLIC DOMAIN

In 1907 the name "forest reserves" was changed to "national forests" by act of Congress, to indicate that the resources of these areas are not locked up as reserves for the distant future, but are being utilized in accordance with sound forestry practices and the needs of the people of the United States. In 1907, also, Congress passed a law prohibiting any further additions by Presidential proclamation to the national forests from the public domain in Oregon, Washington, Idaho, Montana, Colorado, and Wyoming. A few years later, California, Arizona, and New Mexico were added to the list of restricted States.

Since 1905, the area in national forests has more than tripled and has been extended from the West to the Lake States, the East, and the South. President Theodore Roosevelt gave an enormous impetus to the national forest movement by adding 148 million acres during his administration (1901–09). Today there are 158 national forests, covering a net area of 178 million acres. Withal, there are still several million acres of timber-producing land in the public domain that should be in national forests.

The national forests, as the map on pp. 16–17 shows, sprawl in scattered stretches from Puerto Rico to Alaska and lie within or across the borders of 42 States. In timber stands, they range from the pines of the deep South and the southern hardwoods of the Appalachians to the spruces and pines of the White Mountains in New England and the northern hardwoods of the Lake States; from the piñon and juniper stands in the southern Rockies of New Mexico to the pine and fir forests along the Canadian line in Montana and Idaho; from the chaparral-covered foothills of southern California to the great conifer stands of the Olympic and Cascade Mountains in northern Washington.

In Alaska, where valuable Sitka spruce and hemlock clothe the lower flanks of the coastal mountains, are the Tongass National Forest, extending from the southern tip of the Territory northward, and the Chugach National Forest, located within sight of Mt. McKinley, the loftiest peak on the North American continent. Far to the south, in Puerto Rico, is the Caribbean National Forest, where great trees hung with vines and lianas spread their immense crowns over a steaming tropical jungle of brilliant flowers and moss.

National forests are, for the most part, located in the mountain regions. Those in continental United States contain nearly one-sixth of our forest land suitable for growing trees for commercial use, but much of this area is of low productivity or is at present inaccessible. Timber and other forest products are the chief crops on about half of the national forest land, whereas forage and water are the main products on the remaining area. Considerable areas are above timber line.

West of the Great Plains the headwaters of practically all major streams are in national forests. East of the Plains, the national forests protect the watersheds of several important navigable rivers. Approximately 12 percent of the western cattle and sheep range is in the national forests.

ACQUISITION OF NATIONAL FOREST LAND

Public-domain lands chiefly valuable for timber production or watershed protection can be reserved as national forests by act of Congress or, in some States, by Presidential proclamation. Almost invariably there are intermingled with or related to such lands other areas of similar character in private, county, or State ownership. In general, these must be protected, managed, and utilized in complete unity with the Federal lands if there is to be reasonably effective and economical achievement of the objectives of national forest administration.

Such indispensable unity of management is attainable, ordinarily, only by vesting in Federal ownership the intermingled private lands, under terms and conditions equitable to the owners. In consequence, Congress has enacted a series of laws under which private lands can be acquired through purchase, exchange, or donation. State consent is required by the Weeks Law of 1911 and the Flood Control Act of 1944 for the purchase of private lands. Within the present boundaries of the national forests and purchase units there are approximately 35 million acres of private lands. Outside the national forest and purchase-unit boundaries are many million acres for which a national forest status might best serve the public interest and welfare.

Purchase Areas

The initial national forest movement, which consisted exclusively of the withdrawal of appropriate portions of the public domain, did not meet the needs of that part of the Nation east of the Great Plains, where practically all public lands, except some small and relatively valueless residues, had long before passed into private or State ownership. The establishment of national forests in the East was therefore dependent upon the acquisition of lands by purchase. Congress accordingly enacted the Weeks Law of March 1, 1911, which was amended and extended by the Clarke-McNary Law of June 7, 1924. The national forest system east of the Great Plains stems largely from these two statutes.

The Weeks Law stipulates that no lands can be acquired under its provisions within any State until that State, by act of its legislature, has given consent. The Federal Government has followed a consistent policy of purchasing only lands which the owners voluntarily offer to sell. The right of eminent domain or condemnation has been exercised in less than a score of cases, except by agreement with landowners as a means of quieting title.

Purchase work is conducted under the direction of the Secretary of Agriculture, but no land may be paid for unless its acquisition has been approved by the National Forest Reservation Commission, which consists of the Secretary of War, the Secretary of the Interior, the Secretary of Agriculture, two members of the Senate, and two of the House of Representatives. In order to systematize the program, purchases have been confined to specific areas, known as purchase units, previously approved by the Commission. As a rule, such units are not established unless it is evident that the Federal Government can expect ultimately to acquire a reasonably compact tract of at least 100,000 acres valuable principally for forest purposes.

At the end of 1943, 81 purchase areas had been established under the Weeks Law, as amended by the Clarke-McNary Law: 4 in New England; 12 in the Appalachian region; 2 in the piedmont of North and South Carolina; 16 in the southern pine region; 21 in the Ozark and central hardwood States; 9 in the Great Lakes and upper Mississippi region; 16 in the Western

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FIGURE 2.—Timber-sale area in a national forest. The younger trees, left when the area was logged 30 years before, will soon be ready for cutting. Good reproduction insures future productivity of the forest.

States—North Dakota, Utah, Idaho, Nevada, Oregon, California, and New Mexico; and 1 in Puerto Rico. Purchases in 8 other areas in Utah, Nevada, and California have been authorized by special acts of Congress. The total approved for purchase at the end of 1943 was approximately 18¼ million acres.

Exchanges

Privately owned forest land located within national forest boundaries and best suited to public ownership may be acquired through exchange of national forest land or stumpage in the same State of not more than equal value, under the act of March 20, 1922, as amended, and that of March 3, 1925. By numerous supplementary acts, this exchange procedure has been extended to many areas outside of but adjacent to national forest boundaries.

To protect the public interest, careful and detailed examination and appraisal of both private properties and national forest land and resources are made by qualified Forest Service officers, and the resulting reports are reviewed and checked in Washington. As a further safeguard, publicity is given to pending exchanges by newspaper advertisements in the counties where the offered and selected land and/or stumpage is located.

Up to June 30, 1943, a total of 2,237 exchanges had been made, in which the Government received 3,870,320 acres, valued at $17,234,062, and relinquished 897,452 acres and some 4½ billion feet of timber, valued at $11, 403,526.

Donations

Donations of land valuable for national forest purposes may be accepted by the Secretary of Agriculture on behalf of the United States under the acts of June 7, 1924, and March 3, 1925.

In the main, such donations are made by: (1) Owners of forested areas who for sentimental reasons wish to have them fully conserved and safe-

F406250

FIGURE 3.—Fighting a fire in the San Bernardino National Forest, Calif. Nearly half the fires in our national forests are man-caused.

guarded; (2) owners interested in promoting forest conservation and disposed to dedicate to public purposes forest lands from which some return may be derived; (3) owners of large areas, generally cut over, but occasionally bearing good stands of timber, and often rather inaccessible, who cannot see any market for their land and prefer to donate it outright rather than see it revert for taxes.

Donations up to June 30, 1943, totaled 420 tracts, covering 371,076 acres.

GUIDING PRINCIPLES OF NATIONAL FOREST ADMINISTRATION

The policy under which the national forests are administered by the Department of Agriculture through the Forest Service was laid down by Secretary of Agriculture James Wilson in a letter of February 1, 1905, to the Chief Forester, Gifford Pinchot: [1]

> In the administration of the forest reserves it must be clearly borne in mind that all land is to be devoted to its most productive use for the permanent good of the whole people and not for the temporary benefit of individuals or companies. All the resources of forest reserves are for *use,* and this use must be brought about in a thoroughly prompt and businesslike manner, under such restrictions only as will insure the permanence of these resources. * * * You will see to it that the water, wood, and forage of the reserves are conserved and wisely used for the benefit of the home builder first of all; upon whom depends the best permanent use of lands and resources alike. The continued prosperity of the agricultural, lumbering, mining, and live-stock interests is directly dependent upon a permanent and accessible supply of water, wood, and forage, as well as upon the present and future use of these resources under businesslike regulations, enforced with promptness,

[1] FOREST SERVICE. THE USE BOOK: REGULATIONS AND INSTRUCTIONS FOR THE USE OF THE NATIONAL FORESTS. U. S. For. Serv. Misc. Unnum., 341 pp. 1908. (Revised.) See pp. 14–15.

effectiveness, and common sense. In the management of each reserve local questions will be decided upon local grounds; the dominant industry will be considered first, but with as little restriction of minor industries as may be possible; sudden changes in industrial conditions will be avoided by gradual adjustment after due notice; and where conflicting interests must be reconciled, the question will always be decided from the standpoint of the greatest good of the greatest number in the long run.

The Forest Service has endeavored to follow these wise principles.

Lands that are more valuable for agriculture than forestry have been excluded from the national forests, either by changes in the forest boundaries or by being opened to settlement and entry under the Forest Homestead Act of June 11, 1906. The act of August 10, 1912, which directed that the national forest lands be classified for the purpose of determining those valuable chiefly for agriculture, has resulted in the homesteading of practically all agricultural lands within the national forests.

Mineral deposits in the national forests, except those purchased under the act of March 1, 1911, are open to development exactly as on unreserved public land, unless otherwise provided by special acts of Congress.

The wilderness is rapidly vanishing from the American continent, but within the national forests about 75 areas, covering approximately 14 million acres, are maintained under primitive conditions of environment, transportation, habitation, and subsistence. The most extensive tracts, of not less than 100,000 acres, are known as wilderness areas. Lesser tracts, of from 5,000 to 100,000 acres, are designated as wild areas.

F353333

FIGURE 4.—What reforestation can do—a successful slash pine plantation near Bogalusa, La.

MANAGEMENT OF TIMBER RESOURCES

Mature, ripe, standing timber on the national forests is sold at a fair price. Anyone may purchase timber, but nobody can obtain a monopoly or hold it for speculative purposes. Timber is sold when it is no longer growing at a profitable rate and should give way to younger trees and seedlings which will constitute succeeding crops. Sales are also made in younger timber stands which are partly cut on a thinning or stand-improvement basis so that later on they can yield valuable forest products.

F372977

FIGURE 5.—Forest officer placing United States stamp on pulpwood logs awaiting shipment.

Purchasers of stumpage are required to observe such restrictions as will insure cut-over areas being left in the best condition for future growth. Experienced foresters estimate the quantity and quality of the timber and its approximate value. In fixing the value, all factors which affect the cost of lumbering, such as accessibility, number and kind of necessary improvements, as well as general market conditions, are taken into account. Minimum prices are then set which allow the purchaser an opportunity to make a fair profit. Unless the amount is small, the timber is sold through public advertisement to the highest qualified bidder, except as outlined below.

Before an extensive sales program is started, forest officers make a careful survey of the timber resources and prepare a long-time plan of management, prescribing the amount that may be cut annually or during other fixed periods, and the method and order of cutting. These long-range programs are necessary in order to assure a constant supply of timber for the communities and industries dependent on the forest for raw materials. Only in this way can we make possible the permanent establishment of logging operations, sawmills, wood-using plants, and prosperous communities which look to these industries as a market for their labor.

A recent law approved by the President authorizes the Forest Service to establish sustained-yield units so that the community dependent on national forest and intermingled privately owned timber may continue to exist, rather than become a ghost town when the timber crop has been completely liquidated. Timber cut from a sustained-yield unit will be handled as a unit, and cutting plans will provide for continuous operations. The stumpage value will be determined by careful appraisal.

The trees to be cut on a national forest sale area are usually marked in advance by a forest officer. Where the forest protects a watershed, no cutting is permitted that would injuriously affect stream flow, or start or increase erosion; nor is timber taken from recreational areas where it has a special scenic value. For example, the cutting of historic trees or trees of unusual scientific value, such as the bigtree (*Sequoia gigantea*) of California, is not permitted on national forest lands.

Small timber sales are made by the local ranger and larger sales by the forest supervisor, regional forester, or Chief of the Forest Service.

Settlers, farmers, and other bona fide residents in a national forest community may obtain free timber for their own use as firewood, fencing, and for building purposes, where the removal of such material aids in the protection and improvement of the forest. They may also secure higher grade material, when needed, by merely paying the costs of making the sale.

RANGE RESOURCES AND THEIR USE

Grazing of domestic animals is a major phase of national forest use, particularly in the West. Every year, about 4,500,000 sheep and goats and 1,325,000 cattle, horses, and swine, belonging to some 34,000 permittees, graze in our national forests. If young animals (under 6 months) of all kinds (which are not charged for) are added, the total number comes to about 10,000,000.

Resident settlers and stockmen owning dependent ranch properties get first consideration in the granting of grazing privileges. Each permit specifies the number of stock and the portion of the forest on which they may be grazed during a stated period.

Administration of the range involves the protection, development, and management of the forage resource in such a way as to allow its fullest use

F426704

FIGURE 6.—Cattle grazing on a range in good condition, Coronado National Forest, Ariz. About 10 million animals graze annually on national forest ranges.

consistent with permanent maintenance. Thousands of families are directly or indirectly dependent on these ranges for their livelihood, and nearby stockmen have invested millions of dollars in ranch properties which would be far less valuable without national forest forage.

A good supply of forage can be assured year after year only by not allowing the land to be overcrowded with stock or grazed too early in the season. Under Forest Service regulation, overgrazed range is improved and further damage or denuding is prevented.

PROTECTING OUR WATERSHEDS

Vegetation—forests, brush, and grasses—covering mountain ranges and other large areas exerts a powerful influence on the regularity of our water supplies. Water for domestic and industrial uses and for irrigation comes largely from rain and snow falling on mountains and hills. Here also are the headwaters of our navigable rivers. Congress, therefore, made the preservation of conditions favorable to stream flow one of the principal objectives in the establishment and administration of the national forests.

It has become increasingly apparent that the stability of many industries and communities depends upon the condition of the Nation's watersheds. The relationship of watershed protection to flood control has been brought into sharper focus by the disastrous floods of recent years.

Permanent operation of hydroelectric power plants also depends in large measure upon the regularity of the water supply and the checking of silting. Along the streams within the national forests are many sites suitable for power development. The Government, however, does not permit monopolization of power in any region, or allow power sites to be held without prompt development. Where other values outweigh that of power on a particular site, the principle of the greatest use to the greater number prevails.

A well-kept forest—best of natural soil builders—is nature's great water reservoir. Without vegetation, particularly on steep slopes, there is little to keep water from flowing down hill too rapidly and carrying away much of the soil. On steep slopes, forests and well-sodded pastures hold back more rain water and soil than denuded woodlands or overgrazed ranges.

Foresters know that the preservation of vegetative cover on watersheds will not absolutely prevent floods. Their research findings and observations, however, demonstrate that the retarding effect of such cover can greatly increase the seepage and lessen the amount of runoff pouring into main streams and tributaries after a heavy rainfall. Also, by affording adequate protection to the soil much silt can be kept out of the rivers. Forests, therefore, exert powerful controls on the height of flood crests.

In any national flood-control plan, forestry will play an important part. Good forestry practices may be used with other soil-conserving and water-holding measures to help control the waters at their sources, while engineering works, such as dams, dispersion basins, levees, and spillways, provide protection downstream.

RECREATIONAL FACILITIES

Motorists, campers, fishermen, hunters, winter-sports enthusiasts, and seekers after health, rest, and recreation find in the national forests magnificent opportunities for outdoor life and enjoyment, as shown by the remarkable increase in the number of persons visiting them in the last two decades.

The national forests now contain more than 5,000 camp and picnic grounds, winter-sports areas, organization camps, and resorts developed for

F361575

FIGURE 7.—Skiing in the Green Mountain National Forest, Vt. Recreation is one of the major uses of our national forests.

the convenience, enjoyment, and safety of the public. Facilities include tables and benches, stoves or grates, good drinking water, and sanitary conveniences at camp and picnic grounds; and ski shelters, cross-country courses, ski jumps, and toboggan slides on winter-sports areas. Good roads and trails, marked by signs, make these recreation areas readily accessible.

Recreation camps, operated by municipalities and organizations, and equipped with bunkhouses or cottages, mess halls, recreation halls, and other structures, provide opportunities for low-cost vacations in the national forests.

These forests, which shelter a large part of the country's big game, attract many hunters, while thousands of trout streams and lakes, frequently restocked with fish, offer keen sport to the angler. State fish and game laws apply on the national forests.

Visitors are expected to observe the fire-prevention laws and regulations. They must dispose of their refuse properly, leave clean campgrounds, and refrain from polluting the streams and lakes. Forest officers enforce compliance with sanitary laws and regulations on the part of all motorists, campers, sportsmen, stockmen, permittees, and other persons traveling through or using the national forests.

Permission to occupy national forest land for residential, commercial, or industrial purposes not unfavorable to the protection and management of the forest may be obtained under special-use permits, on payment of moderate fees. Detailed information may be obtained from the forest supervisor or district ranger.

CONSERVATION OF WILDLIFE

The national forests are also becoming increasingly important in preserving and restoring one of America's basic resources—wildlife. They harbor bear, beaver, deer, elk, moose, mountain goat, and bighorn sheep, as well as many kinds of birds and fish.

Wildlife is considered by the Forest Service as a renewable resource, to be managed, like other forest resources, for permanent protection and use, and at the same time contribute to human happiness and well-being. In carrying out this policy the Forest Service cooperates with the Fish and Wildlife Service of the Department of the Interior and the fish and game departments of the respective States, thus assuring adequate resources for hunting and fishing as well as esthetic pleasure to millions of people.

F396810

FIGURE 8.—Mule deer in the Teton National Forest, Wyo. About 2¼ million big-game animals roam the national forests.

Partly as a result of the work of the Forest Service, big game in the national forests has doubled every 10 years since 1908, and has now reached a total of 2¼ million head. In fact, one-third of all big-game animals in the United States, in addition to numerous fur bearers, upland game birds, and common and rare waterfowl, live in the national forests all or part of the year.

Cooperation of the Forest Service with State and local authorities in enforcing the game laws has contributed in no small degree toward conserving their valuable wildlife resources, and making the national forests more attractive to visitors. Special acts of Congress and State laws have designated a number of game refuges situated wholly or in part in the national forests.

RECEIPTS FROM THE NATIONAL FORESTS

It was not expected that rugged and relatively inaccessible mountain lands and areas reduced to wasteland before they became national forests would soon yield revenue to the Government above the cost of administration.

Many of the forests will help supply the country's timber needs after the more accessible commercial lands are cut over. Others, though of supreme importance for watershed protection, do not have large commercial value. Moreover, a great deal of money must be spent for roads, trails, bridges, telephone lines, and other improvements in the national forests. In spite of all this, some of the forests are already yielding returns in excess of operating costs, and annual revenues are gradually increasing. In 1944, total receipts from timber sales, grazing fees, special land uses, and other resources amounted to over 15 million dollars. Normally, receipts from timber sales form the larger part, followed by receipts from forage use.

Since Federal property is not taxable, 25 percent of the gross receipts is turned over to the States, to be apportioned to the counties in which the forests are located for road and school purposes. An additional 10 percent is used for road and trail building in the forests. These, plus the expenditures by the Forest Service for protection and improvements of the national forests, provide direct benefits to the local communities.

IMPROVEMENTS IN THE FORESTS

To make the national forests more useful to the public and facilitate their administration and protection, various kinds of improvements are needed. Some of these are primarily for official use, like fire-lookout stations, ranger and guard stations, and telephone lines; others are purely for the benefit of the public, as, for example, drift fences, stock-watering places, and campgrounds; still others, such as roads, trails, and stock driveways, facilitate the task of administering and protecting the forests and serve the public generally.

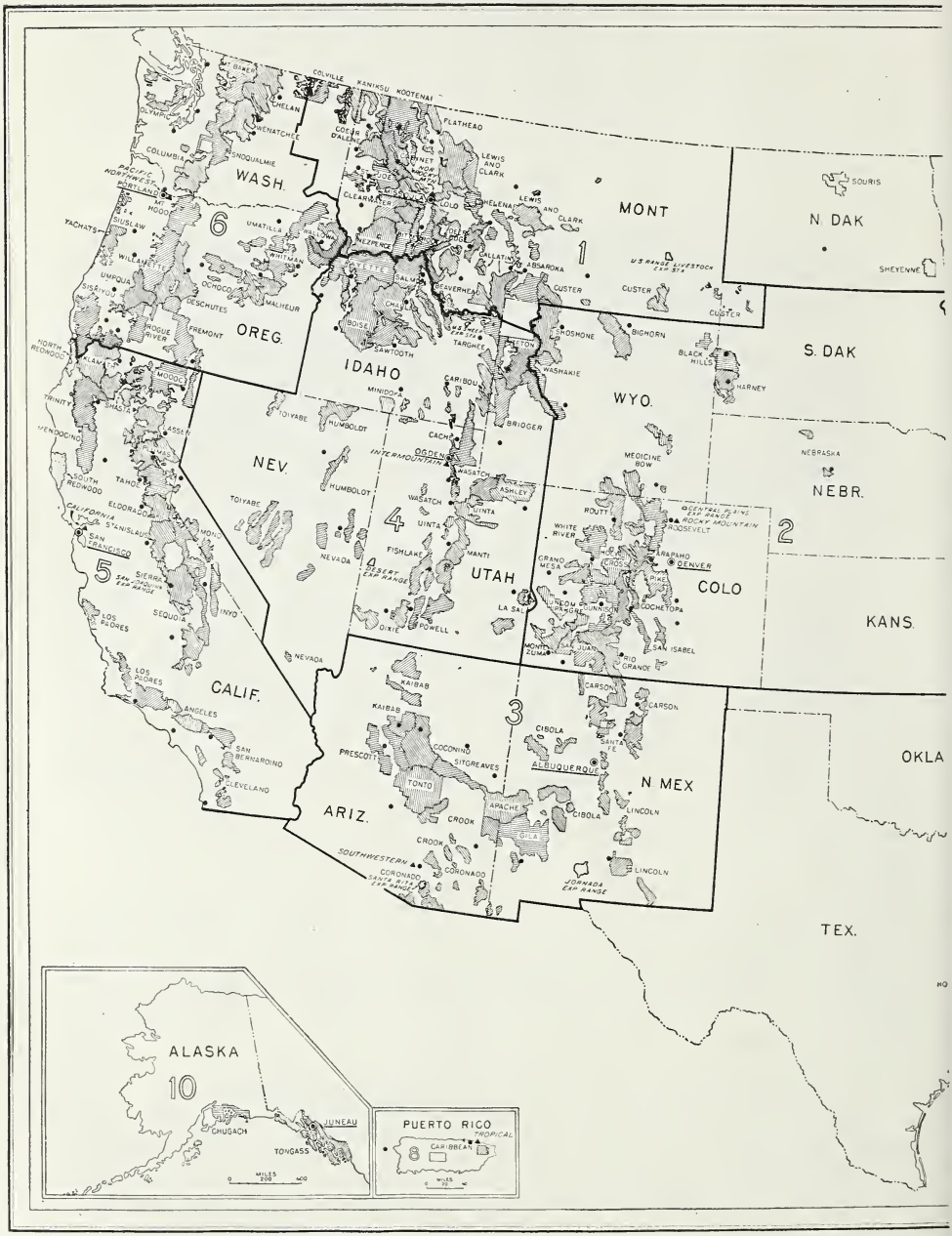
The Forest Service cooperates with State and county officials, good-roads organizations, and private individuals in locating, surveying, constructing, and maintaining roads in the national forests. Road and trail construction work is ordinarily financed from regular appropriations by Congress to the Forest Service, but money has also been made available by special allotments of emergency funds provided by Congress.

Main forest-highway projects are handled by the Public Roads Administration of the Federal Works Agency. The construction, repair, and maintenance of roads and truck trails required primarily for administrative utilization and protective purposes, together with the building and maintenance of foot and horse trails, are handled directly by the Forest Service. Whenever possible, such work is coordinated with fire control, so that in remote areas of great fire hazard construction crews may be available as part of the fire-suppression organization.

Where grazing is a major use of the forest, and the expenditure is plainly warranted, the Forest Service develops water supplies for livestock and builds drift fences, bridges, stock trails, and other works. Local stockmen frequently cooperate in these improvements.

REFORESTATION AND RANGE RESEEDING

Many of our national forests, particularly in the Lake States and the South, contain areas that were devastated by heavy logging and repeated fires prior to their establishment as national forests. Where devastation is so complete that desirable types of forest growth cannot be expected to return naturally, it is necessary to plant trees in order to return them to forest productivity as soon as possible. Most planting is done with tree seedlings grown in Forest Service nurseries, rather than by direct field seeding. A score of such nurseries, with a potential capacity of some 250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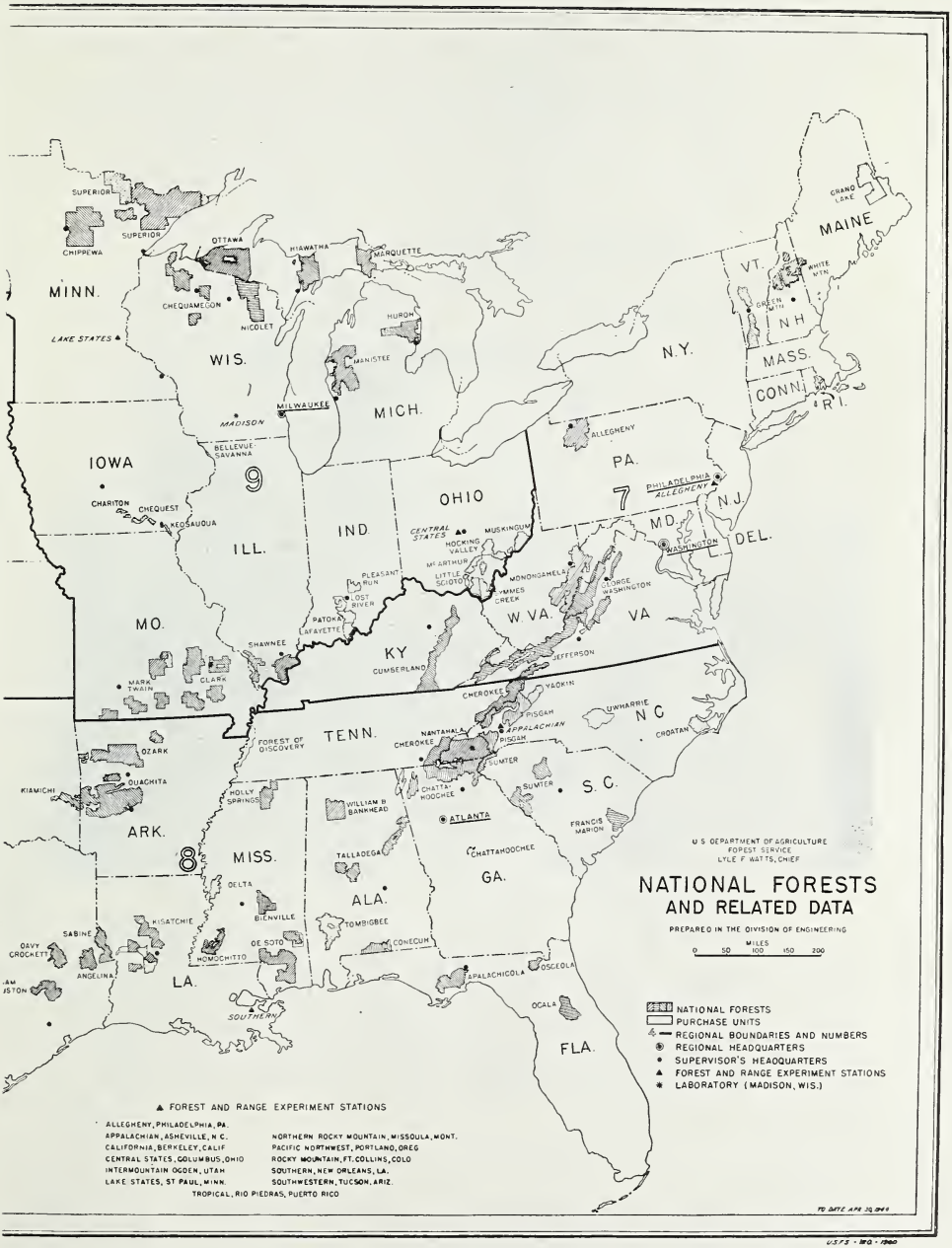
BIGHORN
BLACK HILLS
HARNEY
SHOSHONE
WASHAKIE
MEDICINE BOW
ROUTT
WHITE RIVER
ROCKY MOUNTAIN
ROOSEVELT
ARAPAHO
DENVER
GRAND MESA
CROSS
PIKE
COCHETOPA
SAN ISABEL
RIO GRANDE
SAN JUAN
MONTEZUMA
LA SAL
UINTA
WASATCH
ASHLEY
MANTI
FISHLAKE
DIXIE
POWELL
NEVADA
TOIYABE
HUMBOLDT
CACHE
OGDEN
INTERMOUNTAIN
BRIDGER
CARIBOU
MINIDOKA
SAWTOOTH
BOISE
CHALLIS
SALMON
BEAVERHEAD
TARGHEE
BEAVER
CALLATIN
NEZPERCE
WALLOWA
WHITMAN
UMATILLA
SNOQUALMIE
WENATCHEE
CHELAN
OLYMPIC
COLUMBIA
PACIFIC NORTHWEST
PORTLAND
MT. HOOD
YACHATS
SIUSLAW
WILLAMETTE
UMPQUA
SISKIYOU
OCHOCO
DESCHUTES
MALHEUR
FREMONT
ROGUE RIVER
NORTH REDWOOD
KLAMATH
MODOC
TRINITY
SHASTA
ASSEN
MENDOCINO
SOUTH REDWOOD
TAHOE
ELDORADO
CALIFORNIA
STANISLAUS
SAN FRANCISCO
MONO
SIERRA
SAN JOAQUIN EXP. RANGE
SEQUOIA
INYO
LOS PADRES
ANGELES
SAN BERNARDINO
CLEVELAND
KAIBAB
PRESCOTT
COCONINO
SITGREAVES
TONTO
CROOK
APACHE
GILA
CIBOLA
ALBUQUERQUE
CARSON
SANTA FE
LINCOLN
SOUTHWESTERN
CORONADO
SANTA RITA EXP. RANGE
JORNADA EXP. RANGE
SOURIS
SHEYENNE
NEBRASKA
CHUGACH
JUNEAU
TONGASS


U S DEPARTMENT OF AGRICULTURE
FOREST SERVICE
LYLE F WATTS, CHIEF
NATIONAL FORESTS
AND RELATED DATA
PREPARED IN THE DIVISION OF ENGINEERING
MILES
0 50 100 150 200
NATIONAL FORESTS
PURCHASE UNITS
REGIONAL BOUNDARIES AND NUMBERS
REGIONAL HEADQUARTERS
SUPERVISOR'S HEADQUARTERS
FOREST AND RANGE EXPERIMENT STATIONS
LABORATORY (MADISON, WIS.)
FOREST AND RANGE EXPERIMENT STATIONS
ALLEGHENY, PHILADELPHIA, PA.
APPALACHIAN, ASHEVILLE, N C.
CALIFORNIA, BERKELEY, CALIF
CENTRAL STATES, COLUMBUS, OHIO
INTERMOUNTAIN OGDEN, UTAH
LAKE STATES, ST PAUL, MINN.
NORTHERN ROCKY MOUNTAIN, MISSOULA, MONT.
PACIFIC NORTHWEST, PORTLAND, OREG
ROCKY MOUNTAIN, FT. COLLINS, COLO
SOUTHERN, NEW ORLEANS, LA.
SOUTHWESTERN, TUCSON, ARIZ.
TROPICAL, RIO PIEDRAS, PUERTO RICO
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NICOLET
HURON
MANISTEE
LAKE STATES
MILWAUKEE
MADISON
BELLEVUE-SAVANNA
CHARITON
CHEQUEST
KEOSAUQUA
CENTRAL STATES
MUSKINGUM
HOCKING VALLEY
McARTHUR
LITTLE SCIOTO
PLEASANT RUN
LOST RIVER
PATOKA
LAFAYETTE
SHAWNEE
MARK TWAIN
CLARK
CUMBERLAND
MONONGAHELA
JAMES CREEK
GEORGE WASHINGTON
JEFFERSON
ALLEGHENY
PHILADELPHIA
ALLEGHENY
WASHINGTON
GRAND LAKE
WHITE MTN
GREEN MTN
CHEROKEE
YADKIN
PISGAH
APPALACHIAN
NANTAHALA
CHEROKEE
PISGAH
SUMTER
UWHARRIE
CROATAN
FOREST OF DISCOVERY
OZARK
OUACHITA
KIAMICHI
HOLLY SPRINGS
WILLIAM B BANKHEAD
CHATTAHOOCHEE
ATLANTA
SUMTER
FRANCIS MARION
TALLADEGA
CHATTAHOOCHEE
DELTA
BIENVILLE
TOMBIGBEE
CONECUH
KISATCHIE
SABINE
DAVY CROCKETT
ANGELINA
HOMOCHITTO
DE SOTO
SOUTHERN
APALACHICOLA
OSCEOLA
OCALA
9
7
8

million trees per year, produce young trees for planting in the various national forest regions.

The reforestation program of the Forest Service provided for the planting of about 100,000 acres annually, but provisions for materially increasing this acreage are needed, since some 2,500,000 acres of national forest land are still in need of planting—a valuable reservoir of work for periods of wide unemployment.

Many of our western ranges have been so depleted by past overgrazing that only reseeding to desirable forage species can restore the soil, watershed, and forage values. The Forest Service has reseeded over 100,000 acres of national forest range land. Much more needs to be done. The job is being accomplished as fast as funds become available.

FIRE PREVENTION AND CONTROL

Fire is an ever-present danger on the national forests. The vast size of the forests in relation to the size of the protective forces, the difficulty of

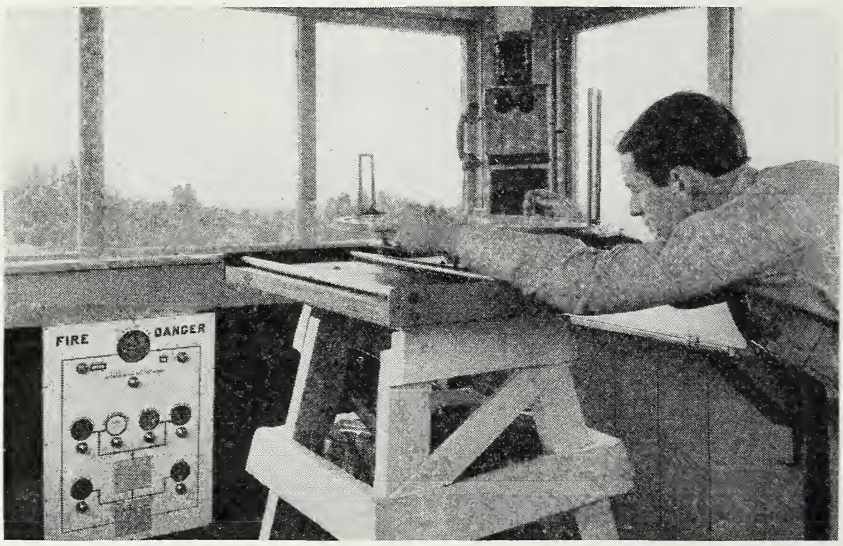

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FIGURE 9.—Determining the location of a forest fire.

reaching remote areas across miles of wilderness, the prevalence of dry winds and light rainfall in parts of the West, the frequency of lightning storms in the mountains, and the constant use of fire by people visiting, dwelling, or working in the forests, combine to make fire a tremendous hazard. The Forest Service has to fight and extinguish more than 10,000 fires within national forest boundaries each year. Among the chief causes of fire are lightning, incendiarism, careless smokers and campers, debris burning, lumbering operations, and railroads. More than half the fires are man-caused.

All fires are small when they start, but even a small fire may spread into a conflagration. Care with fire, matches, and burning tobacco is the first rule observed by good woodsmen. Fires may start in a remote locality and reach vast proportions before a crew of fire fighters can get to the scene. Under particularly dry weather conditions, the forests may be said to be almost explosively inflammable. Because of this, the Forest Service lays tremendous stress upon forest-fire prevention.

During the danger season forest supervisors and rangers concentrate their efforts on fire prevention and the control of fires while still small. Extra fireguards are employed, the forests are systematically patrolled, and a careful watch is maintained from lookout towers and stations on high points.

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FIGURE 10.—Trained "smokejumpers" are dropped by parachute to fight back-country forest fires.

Roads and trails are being built so that all parts of the forests may be quickly reached. The ranger stations and lookouts are connected with the supervisors' offices by telephone and radio so that fire fighters can be quickly assembled. Emergency tools and food supplies are stored at convenient places.

Fire-Fighting Equipment

Airplanes are now extensively used in scouting and patrolling large fires, and in detecting them during periods of low visibility. Planes are also employed for the rapid transport of forest officers and fire fighters. The Forest Service sometimes operates its own planes, but usually they are chartered from commercial companies.

Men and supplies are dropped by parachute for prompt attack on fires in remote and inaccessible areas. This is now a regular part of the protection program in the Pacific Northwest and northern Rocky Mountain regions and will be extended to other areas as rapidly as funds and trained "smokejumpers" become available. Where the fire hazards are great and communication difficult, portable short-wave radio sets, specially designed by the Forest Service, are used. Radio provides communication with field crews not within telephone reach, and enables the fire chief to keep a close watch on the progress of the fire and make the most intelligent use of manpower and equipment.

Weather Bureau observations are made regularly at many Forest Service stations. Forecasts of fire weather are sent at regular intervals to forest officers, and when critical conditions are indicated, special preparations to meet them are made. Weather Bureau trucks, equipped with radio and meteorological instruments, are dispatched to the major fires, where specialists collect information for local interpretation and communication to the forest officer directing the fire fighting.

Other significant developments in fire prevention and control are: Training of forest personnel and recruits for the fire-control organization; technical research in fire-control plans, standards, and instruments; improvement of fire-fighting tools and mechanical equipment; and the Nation-wide fire prevention campaign conducted each year in cooperation with State foresters, civic and conservation associations, women's and youths' organizations, and many other groups, business enterprises, and individuals.

FOREST-INSECT AND TREE-DISEASE CONTROL

Aggregate losses from insect damage in the forests of the United States are enormous. The principal pests are bark beetles and defoliating insects. Among the former are the western pine beetle, the mountain pine beetle, the Black Hills beetle, the Engelmann spruce beetle, the southern pine beetle, and the eastern spruce beetle. The gypsy moth, spruce budworm, and larch sawfly are serious defoliating insects. Beetle outbreaks frequently follow forest fires when, because of damage by burning, the trees have low resistance.

Where insect attacks reach epidemic proportions on the national forests, control measures are undertaken by the Forest Service in cooperation with the Bureau of Entomology and Plant Quarantine of the Department of Agriculture. Experimental work in insect control is also carried on in cooperation with this bureau.

Tremendous losses of timber and young growth are caused by tree diseases, some of the most destructive of which have been brought into the United States on foreign-grown planting stock. Efforts are now being made to combat those already imported and to prevent, by quarantine, the importation of new blights.

One of the most destructive and widespread of tree diseases is the white pine blister rust, of foreign origin, first discovered in New York State in 1906. This fungus attacks eight species of white pine in the United States,

three of which have great economic importance. The total stand of timber potentially susceptible to these spores has a stumpage value of over $300,000,000.

White pine blister rust has spread from Maine to Georgia, and westward to Minnesota, the northern Rocky Mountain region, southern Washington, Oregon, and northern California. The disease cannot go directly from one pine to another, but passes to currant and gooseberry bushes (*Ribes*) and thence to other pines. Since the spores are delicate and their infecting range limited to relatively short distances, control is effected by destroying the currants and gooseberries growing in the vicinity of white pines.

Control areas on Federal, State, and private lands total more than 28 million acres. Initial *Ribes* eradication has been performed on over two-thirds of this area, and about 7 million acres have been reworked one or more times.

In the control of tree diseases in the national forests, the Forest Service is aided by the Division of Forest Pathology, Bureau of Plant Industry, Soils, and Agricultural Engineering, and the Division of Plant Disease Control, Bureau of Entomology and Plant Quarantine, of the Department of Agriculture. The Division of Forest Pathology maintains pathologists in several Forest Service regional offices and forest experiment stations.

Cooperation With States and Private Owners

Management of our forests so that they will produce abundant forest crops continuously is necessary if the social and economic values of these lands are to be permanently retained. That this principle is workable has been proved by progressive private timberland owners as well as in the management of the national forests. The time has come when such management should be extended to all commercial forest lands in private ownership.

BETTER MANAGEMENT OF PRIVATE FORESTS

The Nation depends primarily on privately owned forests for its timber supply. Of the total land area in the United States suitable to growing commercial timber crops, 340 million acres are in private ownership and only about 120 million acres in some form of public ownership. The private timberlands are generally the most accessible, easiest logged, and most productive. They supply over 90 percent of all our lumber and other forest products, contain nearly two-thirds of our critical watershed areas, and are important to our welfare in many other ways.

The United States uses tremendous quantities of wood in peace and war. Abundant natural resources are essential to the realization of our ideals of peace and plenty. They can be developed and maintained only through far-sighted conservation.

It is clear, therefore, that the public has a vital interest in the proper management of all forest lands, regardless of who owns them. Bad cutting practices, fires, pests, and disease are depleting our merchantable timber much faster than it is being replaced by new growth.

Reports of millions of trees planted and increased fire protection have led many citizens to believe that the forestry problem is being met adequately. But it should be borne in mind that a million seedlings cover only about 1,000 acres and that, even after an area is planted, we must wait from 50 to 100 years or more before the seedlings grow into high-quality saw

timber; that throughout the country some 25 million acres or more need to be planted; and that the gains from fire protection can be offset by losses through destructive cutting.

Nevertheless, progress has been made in recent years. In every forest region of the country some private timberland owners and operators are harvesting their tree crops with an eye to the future productivity of the forest, thus demonstrating that good forestry is practicable and economically sound. But these far-sighted owners and operators are in the minority, since, according to recent estimates, some 80 percent of all cutting on private lands is done without conscious regard for future forest crops and a large part of this cutting is of a very destructive character. This may be due to lack of knowledge, business reasons, or indifference. Regardless of the cause, we cannot afford to allow destructive forestry practices to go on.

A 4-Point Program

To protect the public interest, the Department of Agriculture and the Forest Service have recommended a 4-point Nation-wide forest-conservation program:

1. *Expansion of public aid to private forest landowners for fire protection, insect and disease control, research, etc.*

2. *Sufficient public regulation of cutting and other forest practices on private land to stop deterioration and destruction of the forest resource and to keep the land reasonably productive.*

This would require basic Federal legislation setting up broad standards of forest practice, such as prohibiting premature or wasteful cutting in young stands, and clear cutting except under special circumstances. If the States did not, within a reasonable time, enact and carry out satisfactory measures, the Federal Government would be authorized to do the job. The basic standards need not be as high as those which generally obtain on national forests or are followed by many progressive private owners, but they should be high enough to stop further destructive exploitation of our forests.

3. *Purchase by States, communities, and the Federal Government of tax-delinquent, submarginal, critical watershed, and other forest lands which otherwise cannot be kept productive or adequately protected.* A necessary corollary of public ownership, of course, is adequate provision for the restoration, development, and utilization of the public forests.

4. *A comprehensive post-war national program of forestry.*

The Nation's forests offer opportunities for the employment of many thousands of veterans and war workers. Useful and needed work in forest restoration and development includes improvement and expansion of facilities for forest protection and management; fire hazard reduction; measures to improve timber growth; reforestation; range improvement, including revegetation of depleted ranges; watershed improvement and flood control; new forest recreation facilities; wildlife development; and development of forest research and administrative facilities.

With a sound forest conservation program, this Nation can eventually be assured of an ample supply of timber and other forest products for all its prospective needs and a margin for export as well.

The Southern States offer an important example of the need for extending sound forestry management to private lands. In this region there is a capital investment of approximately $150,000,000 in pulp and paper mills dependent upon forests for raw material. There are more than 10,000 sawmills and a tremendous naval stores industry in the area, while such forest byproducts as telephone poles and railroad ties add to the timber

income. About 800,000 people look to the primary wood-products industries of the South for their livelihood.

Because second-growth timber on which the wood-products industries largely operate too often is cut without consideration for future forest production, a vast area in the South, as has already occurred in greater or less degree in other regions, will eventually be contributing far less than it should to the economy of the region. This is the type of problem, with variations in regional, industrial, and economic backgrounds, that the Forest Service, through cooperation with State forestry departments and private woodland owners, is attempting to solve. It is only by carefully husbanding the remaining old growth and proper management of existing young growth that we can hope to bridge the gap between the exhaustion of the available supply and the fruition of whatever forest restoration program is undertaken. Failure to do this will inevitably lead to drastic curtailment of timber supplies.

Farm Forest Work

The Government under the Norris-Doxey and Clarke-McNary Acts assists farm-woodland owners in the management and care of their timber. Approximately 185 million acres, or about one-third of the privately owned forest land of the country, is in farm woodlands. Of this total, 139 million acres are capable of producing continuous timber crops and 46 million acres are chiefly valuable for watershed or windbreak protection and as a source of fuel wood, fence posts, and other materials for farm use.

The majority of the 3½ million farmers who own woodlands are not familiar with the technical aspects of forest management, and do not appreciate the destructive effects of overcutting or overgrazing. Likewise, many are unaware of the increased returns from good timber management, though forest products sold from the farm rank tenth among the 50 leading farm crops.

In farm forestry work the Department of Agriculture, through its Forest Service, Extension Service, and Soil Conservation Service, cooperates with State extension services, State foresters, soil conservation districts, and agricultural experiment stations in 43 States, Puerto Rico, and Hawaii. Emphasis is placed on the more efficient management of farm woodlands; reforestation of lands not suitable for agriculture; the proper harvesting, marketing, and utilization of farm timber; and the promotion of rural fire prevention. The Federal Government cooperates with the State agencies in the employment of foresters to stimulate interest, give technical advice, and bring the farmer and buyer together. State agencies largely direct the work on the ground. Demonstration areas have been established in many States, where farmers can see practical measures of controlling soil erosion, reducing flood dangers, and increasing forest and woodland values through proper woods practices.

On June 30, 1942, the Secretary of Agriculture allocated to the Forest Service funds available under the Cooperative Farm Forestry (Norris-Doxey) Act to establish a forest-products marketing service for farmers. In addition to assisting the farmer to obtain full value for his products, the service rendered includes estimating the quantity of timber ready for removal, marking trees to be cut in accordance with good forestry practices, providing a sample form of sales agreement, and helping to obtain competitive bids. The program has been instrumental in stepping up lumber production for war needs in the Eastern States without further depletion of future growing stock.

The Federal Government, through the Forest Service, also cooperates with the States under the Clarke-McNary law in the production and distribution of tree seedlings to farmers for the planting of windbreaks, shelterbelts, and farm woodlands. In normal years from 75 to 100 million trees are sold and distributed by State forestry departments and comparable agencies. Interest in forest planting is due to increase rapidly, and existing nurseries are making plans to meet the future demand for trees.

Naval Stores Program

The naval stores conservation program of the Department of Agriculture is administered by the Forest Service in cooperation with the Agricultural Adjustment Agency. The general objectives are: (1) Conservation of timber resources; (2) the prevention of uneconomic use and wasteful exploitation of naval stores trees through the adoption of approved turpentining practices; (3) better fire protection; and (4) better cutting practices. Several thousand operators, producing the major part of the naval stores output in the South, are cooperating in the program.

AID TO THE STATES

Under the provision of the Clarke-McNary law of 1924 the Federal Government offers financial aid to 42 States and the Territory of Hawaii to bring fire protection to private and State-owned lands. The total area in the United States in need of organized fire protection is estimated at 428 million acres, but that under actual protection is approximately 291 million acres. Thus, one-third of the area needing protection, the bulk of which lies in the South, is still unprotected. The Forest Service is endeavoring to extend and strengthen organized protection.

Each year approximately 200,000 forest, brush, and grass fires burn over 30 million acres on State and private lands. More than 60 percent of the fires occur on unprotected areas, and more than 90 percent of the burned-over land is not under protection.

Cooperative fire-prevention projects are administered by the State forestry departments, aided by the Forest Service, which furnishes over-all supervision and inspects the work. Under the Clarke-McNary law, Federal expenditures in any State are limited to a sum not greater than that expended by the State and cooperating private owners. At present about $15,000,000 is spent annually on cooperative fire prevention. The Federal Government contributes about 41 percent of the total, the States 42 percent, and private owners 17 percent.

COMMUNITY FORESTS

Community forests are an old and accepted form of forest conservation, dating from the Colonial period. There are more than 2,200 community forests in the United States, covering more than 3 million acres. They include municipal, county, village, township, school, and other local public forests.

Community forests bring forestry close to the people. They grow timber for local industry, yield income which helps reduce taxes, provide recreation areas, protect domestic water supplies, furnish work for unemployment relief, beautify the landscape, and, when used as an educational laboratory, are important adjuncts of public school systems.

Despite the fact that the earliest managed forests were community forests, this branch of forestry for many years lagged far behind that of national,

State, and private forestry. Only within the past two decades has there been a marked growth of interest in and development of community forests.

It is the Forest Service's responsibility to exercise leadership in all phases of forestry for the public welfare, including the establishment of community forests. Many Forest Service officers give technical aid to those in charge of community forests in their locality.

SHELTERBELT PROJECT

The Forest Service is vitally concerned with the use of trees in the prairie-plains States. Field windbreaks or shelterbelts are planted in order to provide protection from winds and to help prevent the blowing of soils by checking the velocity of winds. Similarly, they shield growing crops from critically drying winds, add materially to the beauty of the landscape, attract bird life, and improve living conditions for man and beast.

The Prairie States Forestry Project—as it is called—was started by the Forest Service in 1934. On June 30, 1942, its administration was transferred to the Soil Conservation Service. During this 8-year period, 18,600 miles of remarkably successful field shelterbelts were planted on over 33,000 farms in North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. The Nation will be permanently benefited by the soil stabilization and reduction of dust storms resulting from the protection afforded by shelterbelts.

Forest Service Research

Of basic importance to the administration of the national forests, as to all timber, watershed, and range lands, are the organized fact-finding and interpretive activities that comprise forest and range research. This function of the Forest Service is classified under several broad subjects: forest management and protection, forest influences, utilization of forest products, management and revegetation of forest and other ranges, forest economics, and forest survey.

All lines of forest research head up in Washington, D. C., but by far the greater part of the work is conducted at 12 regional forest and range experiment stations and at the Forest Products Laboratory, Madison, Wis. The territories of the experiment stations roughly correspond to the major forest-type regions of the country. Research results are made available for use not only on the national forests but also on other Federal, State, county, municipal, and private lands.

Certain areas, most of which lie within the national forests, have been designated as experimental forests or ranges and set aside as outdoor laboratories on which much of the research in forest, range, and watershed management is carried out. These areas, of which there are several in each region, are under the general supervision of the forest experiment stations.

The "natural areas," set aside by the Forest Service to illustrate or typify virgin conditions of forest or range cover, are used for purposes of research as well as for historical and educational values. The natural areas, and also the experimental forests and ranges, are generally restricted to use by research or educational institutions. On the experimental forests and ranges the cutting of timber, grazing of cattle, and other uses are permitted only to the extent that they form part of the research plans.

FOREST MANAGEMENT AND PROTECTION

The purpose of research in forest management is to discover and interpret the facts upon which the full productive management of forest lands for

timber growing rest. Investigations conducted in all the important forest types in this country and Puerto Rico are directed toward furnishing the owner of timberland, whether farmer or lumberman, State or Federal Government, assistance in deriving the highest returns from the forest and, at the same time, maintaining stabilized industrial communities.

Forest-management research includes a variety of subjects. For example, forest regeneration, artificial or natural, calls for studies of seed production and germination, nursery and planting practice, and sprout and seedling growth. Forest trees are studied for the development of improved quality, better growth rate, or other desirable characters. Intensive investigations are made of thinning practice, the growth rate of trees and stands, and methods of harvesting the forest crop to obtain the best natural reproduction.

Research also has an important place in forest-fire control, which is aided by studies of forest-fuel inflammability, weather conditions, and the development of fire-fighting equipment. Apparatus for detecting forest fires under different conditions of visibility is being devised or perfected. Fire

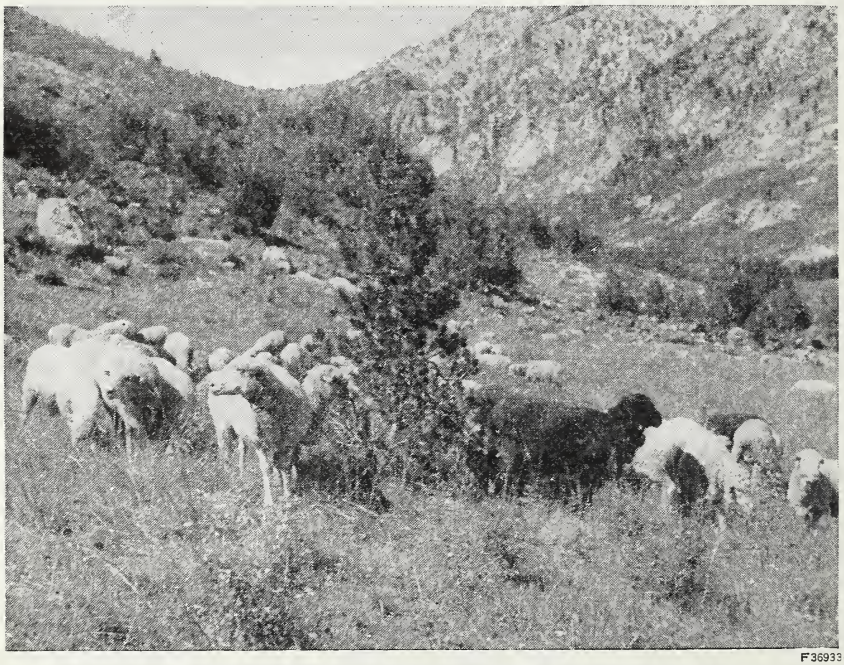

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FIGURE 12.—Sheep grazing on a summer range in a Nevada national forest.

damage, the recovery of forests after fire, changes in the growth and quality of forests after recurrent fires, and many related problems are being investigated.

RANGE INVESTIGATIONS

Range research furnishes the basis for sound management of forest and other range lands. Its objectives are to obtain and supply Federal, State, and private agencies with basic information needed to perpetuate and improve all range-land values.

Range research is being carried on at the regional forest and range experiment stations in the West, the South, and the Southeast, and in Washington. Broadly speaking, it is concerned primarily with:

(1) *Grazing-management studies,* which aim to determine the grazing capacity and proper seasonal use of the various types of range; develop ways and means of maintaining and increasing forage and livestock production; improve methods of handling livestock on the range; control losses from poisonous plants; and harmonize grazing with watershed management, timber production, fire protection, wildlife conservation, and other land values.

(2) *Range-forage investigations,* which involve the collection and analysis of information on the identity, distribution, life histories, and forage, watershed, and other values of range plants.

(3) *Artificial-reseeding investigations,* which aim to determine which native species justify selection for revegetation, the possibilities of adapting native and introduced species to seeding or transplanting, and to determine how these plants can be most economically reproduced and established on range lands under varying conditions of climate, soil, and range-forage depletion.

FOREST ECONOMICS

Research in forest economics covers the entire range of economic and social problems associated with the production and utilization of forest resources, particularly forest-land use and management.

Correlated projects under way include studies to determine the economic feasibility of timber growing; equitable methods of forest taxation; the possibility and principles of forest insurance; the extent of tax delinquency and reversion to public ownership of forest land and the practicability of remedial measures; and the collection, classification, and interpretation, in cooperation with the Bureau of the Census, of economic data on the production, distribution, consumption, and price of forest products.

A comprehensive survey of the forest resources and requirements of the United States is now in progress. This Nation-wide study involves an inventory of the extent, location, and condition of forest lands; the quantity, kinds, quality, and availability of timber now standing on these lands; the rate of depletion through cutting, fire, insects, disease, and other causes; the current and probable future rate of timber growth and the productive capacity of our forest area; and the present and probable future requirements for forest products in different parts of the country, by all classes of consumers. The survey attempts to interpret and correlate these findings with related social and economic factors as a basis for formulating policies, principles, and plans of forest-land management and use, both public and private.

FOREST INFLUENCES

Closely coordinated with forest and range research are investigations of forest influences to determine the effect of forests, brush, and other natural cover upon water, soil, and climate. Such studies are under way at a number of forest experiment stations with special emphasis on the extent to which natural vegetation may be supplemented by minor engineering works, and whether or not timber cutting, livestock grazing, and other uses of the forest and range cover adversely affect the water flow.

A major concern, as already noted, is the influence of forests on floods. Under the Flood Control Act, the Forest Service plays an important part in the Department of Agriculture program to determine the measures which should be taken to control floods on our major watersheds. Foresters believe that the control of water at the place where rain falls or snow melts has a marked bearing upon other flood-control operations.

FOREST PRODUCTS

Research in forest products, conducted by the Forest Products Laboratory and at some forest experiment stations, is designed to increase the value of the forest crop through improvements in wood utilization, development of new uses for wood, and use of waste and tree species now considered inferior or worthless. The work includes, for example, determination of the

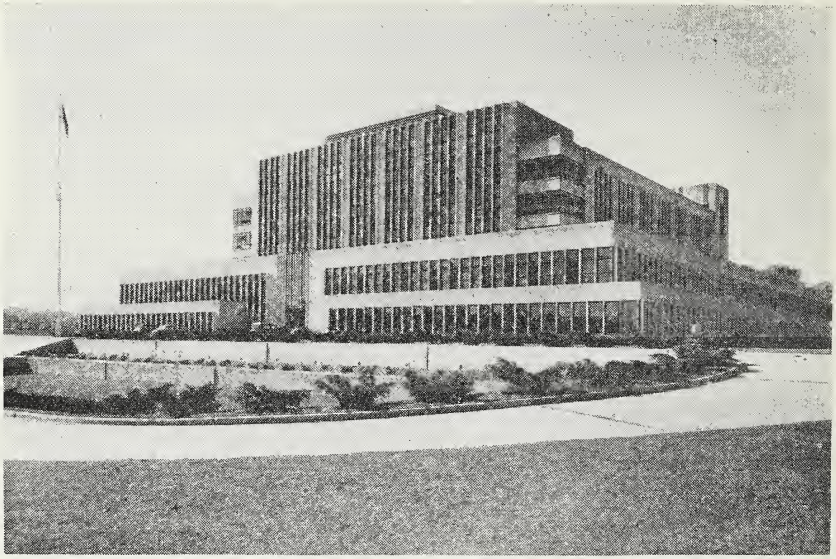

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FIGURE 13.—The Forest Products Laboratory, Madison, Wis., premier wood-research institution in the United States.

strength properties of wood, improved methods of fabrication and design, wood preservation by chemicals to prevent decay and decrease inflammability, painting and gluing of wood, pulp and paper-making possibilities of various species, improved methods of seasoning, chemistry and chemical utilization of wood, and methods of selective logging to bring about the profitable and permanent management of forest properties.

Information on Forestry

The Forest Service places at the service of the public its fund of information about forestry accumulated in 40 years of experience, in helpful practical bulletins, reports, circulars, and statements.

Information is provided to timberland owners, farmers and other small landowners, livestock producers, lumber manufacturers, and others on such subjects as tree planting for timber production, management of timber stands, range management, windbreak planting, control of erosion, properties and uses of wood, wood seasoning and preservative treatment, methods of obtaining or utilizing forest products, etc. Forest Service experts are available in many regions for personal consultation.

The Service has a collection of about 500,000 photographs showing forest conditions, forest utilization, and forest work in all parts of the United States. This collection is open to the public. Prints may be borrowed. Other educational material—such as recreation folders, posters, photo-

graphs, exhibits, maps, lantern slides, radio scripts, and motion pictures—may be secured from the Forest Service by schools, libraries, clubs, and other interested institutions, organizations, and individuals. Lists are available upon request.

Forest Service Organization

The national forests and purchase units cover about 178 million acres, of which over 136 million acres are in the mountain regions of the West, 21 million acres in Alaska, and 21 million acres in the Middle West, Southeastern States, and Puerto Rico. The protection, administration, and development of this vast area constitute an enormous task.

The administration of the national forests and all matters relating to forestry which have been charged to the Department of Agriculture by Congress are, under the direction of the Secretary of Agriculture, in the hands of the Chief of the Forest Service, whose office is in Washington, D. C.

In order to prevent delays in administration and to keep in closer touch with problems as they arise in the field, the country has been divided into 10 national-forest regions, as follows:

Region 1. Northern region (Montana, northeastern Washington, northern Idaho, and northwestern South Dakota), Federal Building, Missoula, Mont.

Region 2. Rocky Mountain region (Colorado, Wyoming, South Dakota—except the extreme northwest part—Nebraska, and Kansas), Post Office Building, Denver, Colo.

Region 3. Southwestern region (Arizona and New Mexico), Post Office Building, Albuquerque, N. Mex.

Region 4. Intermountain region (southern Idaho, Nevada, Utah, and western Wyoming), Forest Service Building, Ogden, Utah.

Region 5. California region (California and southwestern Nevada), Appraisers Building, Sansome and Washington Streets, San Francisco, Calif.

Region 6. North Pacific region (Oregon and Washington—except northeastern part), Post Office Building, Portland, Oreg.

Region 7. Eastern region (Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, West Virginia, and Kentucky), Bankers Securities Building, Philadelphia, Pa.

Region 8. Southern region (North Carolina, Tennessee, South Carolina, Georgia, Alabama, Mississippi, Florida, Arkansas, Louisiana, Texas, and Oklahoma), Glenn Building, Atlanta, Ga.

Region 9. North Central region (Michigan, Wisconsin, Minnesota, North Dakota, Iowa, Missouri, Illinois, Indiana, and Ohio), Madison Building, Milwaukee, Wis.

Region 10. Alaska region (Alaska), Federal and Territorial Building, Juneau, Alaska.

Tropical Forestry Unit. (Puerto Rico), Box 577, Rio Piedras, Puerto Rico.

High standards are maintained in the selection of all Forest Service personnel. The Service has approximately 8,500 regular employees, appointed after passing civil-service examinations. Of these, more than 96 percent are in various field positions.

The national forests are grouped by regions, each of which is under the direction of a regional forester. His staff generally consists of an associate regional forester, assistant regional foresters, and experts in the various aspects of Forest Service work, such as engineering, fire control, fiscal control, information and education, operation, personnel management, range management, recreation and lands, State and private forestry, timber management, and wildlife management.

Every national forest is in charge of a forest supervisor, who plans and supervises the work under the direction of the regional forester. Where the amount of business warrants it, the supervisor has staff assistants. Supervisors and their assistants must be experienced in forest work, construction

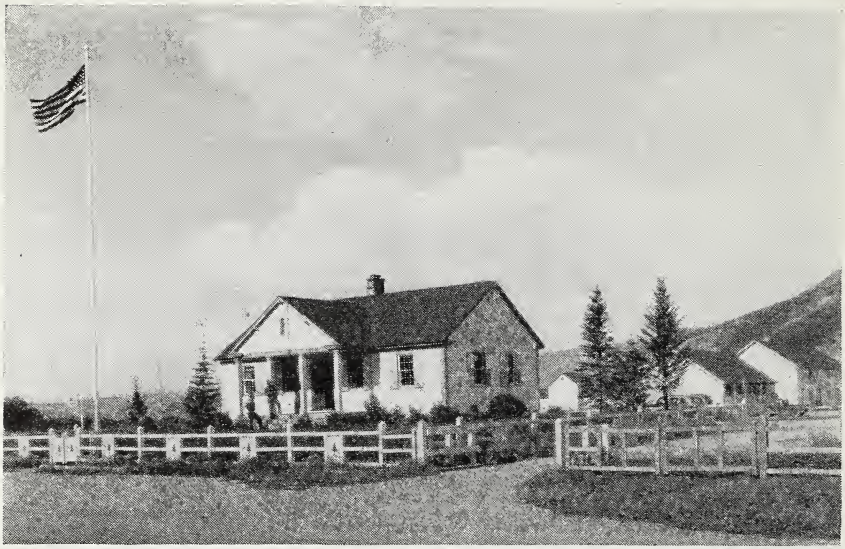

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FIGURE 14.—Administrative buildings of the Teton National Forest, Wyo.

of improvements, livestock management, wildlife development, administration of recreational resources, and other national forest activities. Supervisors' headquarters are located in towns conveniently situated near the forests.

Junior foresters and junior range examiners are employed in technical and administrative work on the forests. For these positions, graduation from a recognized college or university is required. Men who pass the professional examination are first assigned as assistant district rangers or detailed to subordinate technical jobs. After not less than 2 years a junior forester who has rendered satisfactory service may be made district ranger or assigned to road and trail construction, fire control, timber culture, range management, wildlife, recreation, forest planting, or general technical work.

Every national forest is divided into ranger districts ranging from 50,000 to 300,000 acres or more, with a district ranger in charge of each. The ranger supervises timber sales, grazing, recreation, fire protection, and construction of roads, trails, and other improvements and use of forest resources on his district. Both technical training and practical experience are required and physical soundness is essential. Rangers are chosen from employees of the Forest Service who have demonstrated their administrative ability.

In districts where the work is heavy, the ranger has one or more assistants. Ordinarily, junior foresters are selected for these positions.

In addition to the above, logging engineers, lumbermen, scalers, land examiners, planting assistants, engineers, landscape specialists, wildlife specialists, economists, ecologists, etc., are employed on the forest in timber appraisal, cruising, scaling, forest planting and nursery work, and in other specialized activities.

About 5,000 forest guards are appointed each year as temporary employees during the season of greatest fire danger. These men are usually thoroughly familiar with the region where they serve.

CIVILIAN CONSERVATION CORPS

At the request of President Franklin D. Roosevelt, Congress on March 31, 1933, created the Civilian Conservation Corps to give young men a chance to obtain healthful employment and accomplish constructive conservation work on our vast Federal, State, and private forest lands. At its peak in 1935, the Corps had 520,000 enrollees working in 2,652 camps, of which 1,303 were forestry camps. The CCC was terminated by Congress on June 30, 1942. During the 9 years of its life it enrolled 2,965,959 men 17 to 23 years of age, and 189,165 older war veterans.

At the beginning, CCC work projects were almost entirely directed by the Forest Service. Later, as the program broadened, the Service retained responsibility for the work of Federal, State, and private forestry camps and for projects assigned to the Tennessee Valley Authority.

The magnitude of the CCC's contribution to American forestry is only partly indicated in the statistics of work done, which involved an estimated 730,000 man-years of labor, valued at $876,000,000, and included the building of lookout towers, cabins, bridges, and dams; improvement of campgrounds and recreational sites; construction of telephone lines, roads, trails, and firebreaks; planting of trees and thinning and improvement of forests; collection of tree seed and planting in nursery beds; fighting forest fires, combating forest insects and disease; and many other conservation projects.

The CCC left the Nation with a vastly improved natural resources balance sheet. Its outstanding contribution to the youth of America was the building up of morale, vocational training for vital jobs in industry, and giving millions of young men an understanding of our forestry problems.

WARTIME ACTIVITIES

Recognizing the challenge which production for defense would mean to conservation, the Forest Service mobilized its manpower and facilities as soon as the defense program began in the summer of 1940. Consequently, after the Japanese attack on Pearl Harbor, it was able immediately to put its far-flung organization, staffed by men familiar with local conditions and competent to handle technical problems, at the service of the war agencies.

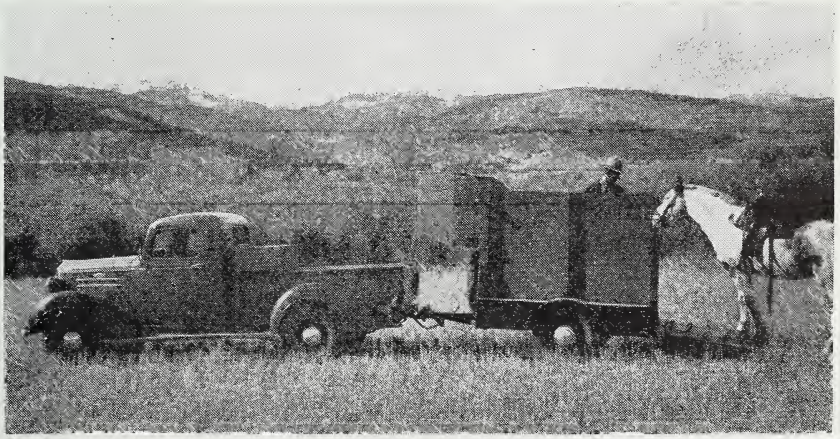

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FIGURE 15.—The ranger usually travels in a light pick-up truck, but on trips to remote areas he takes his horse, leaving truck and trailer at the end of the road.

Among the important wartime activities of the Forest Service has been the stepped-up cutting of national forest timber to meet greatly accelerated demands. Special authority was obtained to reduce the time required by law for advertising sales and to sell without competitive bids where this promoted the war effort. By opening up new stands and utilizing tree species ordinarily considered unmerchantable, the increased cut was obtained without violating sustained-yield principles, or jeopardizing the welfare of the communities dependent upon the national forests. An important new source of timber was the Tongass National Forest in Alaska, from which over 38 million board feet of high-grade airplane spruce was obtained in addition to about 46 million board feet of lower-grade spruce and hemlock.

A Timber Production War Project was created by the War Production Board and directed by the Forest Service. Efforts were concentrated on maintaining and expanding the production of lumber, pulpwood, and naval stores, chemical wood, and other wood products—all critical war materials—especially through small operators east of the Plains region.

The war created tremendous new needs for wood products. In meeting these needs the Forest Products Laboratory has taken a leading part. It helped to solve problems of packaging, loading, and shipping all sorts of fighting weapons to the battle fronts, and gave training courses for members of the armed services and representatives of war industries in packaging, container construction, repair and maintenance of wood aircraft, and other subjects. The Laboratory devised important new materials, such as "compreg," formed by the compression and impregnation of wood with phenolic resins, which has strength properties comparable to steel and is used in aircraft production. It also adapted old materials to new uses, such as the manufacture of alcohol from wood waste, now being undertaken on a commercial scale.

To the Forest Service fell the job of undertaking the production of natural rubber from domestic sources. Guayule, a plant native to northern Mexico and Texas, was selected as the most promising source. Some 30,000 acres were planted to this shrub and harvesting and extraction of rubber from these plantations began in the winter of 1944. The Agricultural Research Administration cooperated on research phases of the project.

Other wartime services of the Forest Service have included extensive surveys, in cooperation with other agencies, of the supply, requirements, stocks, and cost of wood products, and production capacities of wood-using industries. The Service, at the request of war agencies and foreign governments, sent missions to study wartime timber requirements of Great Britain and the forest resources and wood-industries' possibilities of Chile. Missions also went to Costa Rica to study the availability of balsa wood needed for airplane construction and other wood problems, to Ecuador to find wood suitable for shipbuilding, and to Colombia and other South American countries to survey the possibilities of obtaining cinchona, the source of quinine.

The Forest Service Engineering Division helped the armed services in preparing topographic maps, doing map-compilation work, and preparing aeronautical approach charts. It also assisted our fighting forces in developing special equipment—such as a small tractor trailbuilder transportable by airplane and a special tractor for travel over snow—which has materially aided our military operations.

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